IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of: Akihiko YAGASAKI et al.	Art Unit: 2832
Appl. No. 09/597,236	Examiner: Tuyen T. Nguyen
Filed: June 20, 2000	Atty. Docket No. 37174-164287
For: ISOLATION TRANSFORMERS	Customer No. 26694 PATENT TRADEMARK OFFICE

SUPPLEMENTAL APPEAL BRIEF

Commissioner for Patents
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Sir:

In response to the Appeal Brief filed on April 28, 2003, the Examiner issued a final Office Action rejecting all of the claims on new grounds. As a result, two new issues are presented:

1) Whether the Examiner erred in rejecting claim 27 under 35 USC § 102 as being anticipated by Scarpa; and

2) Whether the Examiner erred in rejecting claims 18-27 under 35 USC §103 as being unpatentable over McLoughlin in view of Scarpa.

I. Grouping of Claims

Claim 24 stands or falls with claim 18. None of the other claims stand or fall together. It is requested that the patentability of each of the other claims be determined

individually. Arguments describing additional distinctions of all of the claims, other than claim 24, are presented in the next section.

II. Argument

1) Whether the Examiner erred in rejecting claim 27 under 35 USC § 102 as being anticipated by Scarpa

Claim 27 calls for an isolation transformer having, among other structure, "at least one short-circuit ring formed by coating the copper wire of at least one the primary and secondary coils with a thin conducting film". With respect to this structure, the application presents as the issue to be resolved by the present invention "to provide isolation transformers with high noise attenuation rates as well as high reliability by sufficiently suppressing the amplitudes of noise attenuation characteristic curves, which are irregular, saw-tooth shaped waves with crests and troughs of various sizes, of multi-layer, multi-winding transformers" (paragraph 0015 on page 10). In paragraph 0019, which beings on page 12, under the heading "How to Resolve the Issue" (page 10), the application states: "Each layer of the multi-layer multi-winding coils are formed by winding an insulated, covered, copper-wire, the surface of which is further covered with a conducting film that is made approximately as thick as or less thicker [sic] than the skin depth of the induced current generated by the skin effect in the high-frequency region, where resonances should be suppressed." Paragraph 0019 adds: "The aforementioned conducting thin films have a thickness of 7 μm or less".

The Scarpa reference fails to disclose at least a short-circuit ring formed by coating a wire with a thin conducting film. Instead, Scarpa discloses "actual lead-sheathed cables" (column 2, lines 21-22). In lines 28-31 of column 3, Scarpa states: "The windings A and B are each formed of a conventional cable provided with an external metallic sheathing, for instance of lead of the type employed for the transmission of high-voltage electric power". It is submitted that this description makes clear that Scarpa is not disclosing a coating of a, in the terms of claim 27, "thin conducting film". This fact is made even clearer by the description in lines 37-40 of column 3 of Scarpa that the layers of insulating material 2' and 3' are protected by a metallic sheath 2" and 3"', respectively, of non-magnetic metal, such as lead, or a coil or [of ?] non-magnetic wire or tape. The use of a lead sheath or a coil makes clear that Scarpa is not suggesting a coating of a thin conducting film.

2) Whether the Examiner erred in rejecting claims 18-27 under 35 USC § 103 as being unpatentable over McLoughlin in view of Scarpa.

With respect to claim 27, McLoughlin, like Scarpa, fails to disclose "at least one short-circuit ring formed by coating the copper wire of at least one of the primary and secondary coils with a thin conducting film". Furthermore, it would not have been obvious from the prior art to have provided McLoughlin with at least one short-circuit ring formed by coating a wire with a thin conducting film.

Independent claim 18, on which claims 19-26 depend, calls for an isolation transformer comprising, among other structure, "a plurality of short-circuit rings made of conducting thin films sandwiched between the coil layers of at least one of the primary

and secondary coils". As was discussed in connection with the "thin conducting film" of claim 27, neither Scarpa nor McLoughlin discloses any conducting thin films and, thus, in terms of claim 18, neither reference discloses "a plurality of short-circuit rings made of conducting thin films sandwiched between the coil layers of at least one of the primary and secondary coils". In claim 18, "sandwiched" is used in its ordinary sense. Webster's New Collegiate Dictionary defines the verb "sandwiched" in pertinent part as: "to make into or as if into a sandwich; *esp*: to insert or enclose between usu. two things of another quality or character". It can be seen from Figs. 1, 3 and 4 of the present application that the thin films 4 are inserted or enclosed between two things, the coil layers 5, of another quality or character. It cannot be said of either Scarpa or McLoughlin that there is anything made into or as if into a sandwich between the layers of a coil. More specifically, there is nothing inserted or enclosed between the two coil layers.

Furthermore, it would not have been obvious in view of Scarpa to have provided the transformer of McLoughlin with a plurality of short-circuit rings made of conducting thin films sandwiched between coil layers.

Since claims 19-26 depend on claim 18, it is submitted that they are allowable with it.

In addition, claim 19 calls for the short-circuit rings to be sandwiched between each of the coil layers. The combination of McLoughlin and Scarpa proposed by the Examiner does not have short-circuit rings sandwiched between each of the coil layers.

Claim 20 depends on claim 18 and calls for the short-circuit rings to be sandwiched between selected coil layers. Such sandwiched short-circuit rings are missing from the proposed combination of McLoughlin and Scarpa.

Claim 21 depends on claim 18, and further requires that the coil layers of the primary and secondary coils are sheet-type coil layers. Such layers are disclosed, for example, in Figs. 1 and 3 and page 18, paragraph 0031. McLoughlin and Scarpa fail to disclose such sheet-type coil layers.

Claims 22 and 23 depend on claim 21, which depends on claim 18. Claim 22 calls for the short-circuit rings to be sandwiched between each of the coil layers and claim 23 calls for the rings to be sandwiched between selected coil layers. Both sandwiching arrangements of short-circuit rings are missing from McLoughlin and Scarpa. Thus, claims 22 and 23 further distinguish over McLoughlin and Scarpa in a manner similar to claims 19 and 20.

Claims 25 and 26 depend on claim 24, which depends on claim 18. Claim 24 calls for the coil layers of each coil to be cylinder-type coil layers. Claim 25 calls for the short-circuit rings to be sandwiched between each of the coil layers, and claim 26 calls for the short-circuit rings to be sandwiched between selected coil layers. Cylinder-type coil layers are shown in Fig. 4 and described on page 19, paragraph 32. The insertion of the short-circuit rings into selected inter-coil-layer spaces is disclosed in original claim 5 as it depended from claim 3.

In McLoughlin and Scarpa, each coil appears to have the shape of a cylinder, but neither discloses any coil having cylinder type layers with short-circuit rings sandwiched between either of the coil layers or selected coil layouts.

The differences between the prior art and the isolation transformer of the claims on appeal is further explained by the following:

Scarpa expresses the objects of his invention in lines 26-55 of column 1as follows:

> "The principal object of this invention is to provide a transformer of the type referred to above which is capable of satisfactorily withstanding the action for electrical or arc discharges between adjacent turns and adjacent coils of the transformer windings, respectively, as occur in known transformers in the presence of steep-front voltage waves, such as atmospheric discharges, etc.
>
> A further object of this invention is to provide a transformer of the type referred to above in which the insulation surround the conductors from which the turns and coils are made operates under exactly defined electric field conditions, permitting the use of layers of insulating material of reduced thickness for insulating the coil conductor, and permitting very high operating voltages for the transformer without any risk of deterioration of the transformer insulation or of discharges between the turns or coils, respectively.
>
> A further object of this invention is to provide a transformer of the type referred to above in which the conductors and the insulation thereof are efficiently protected against attack by atmospheric agents, such as moisture, corrosive fluids, etc.
>
> Yet another object of the present invention is to provide an improved transformer of the above character which is of simple design and construction, economical to manufacture and highly efficient the accomplishment of its intended purpose.
>
> Still another object of this invention is to provide a transformer of the type referred to in which the risk of fire in the insulation is minimized."

As quoted above, Scarpa describes that his invention intends to provide a safe and break-proof transformer per se by enhancing the resistance against insulation breakdown that may be caused between coils or between turns in the coil when steep-front waves of extra high voltage are applied, such as by lightning, in an electric high-power high-voltage transformer, by preventing insulation from deteriorating due to the arc discharge that arises because of the remarkable difference in potentials on the surface of insulation covering central conductors between adjacent turns, and by improving protection against corrosive substances during daily operation.

In contrast, the isolation transformer of the claims on appeal aims at keeping systems from malfunctioning by inserting the device in the circuit to prevent IT systems or the like from malfunctioning by the admitted high frequency noise, which involves very frequent trouble, in order to have clean voltage and current on the secondary side by treating the dirty voltage and current contaminated by noise on the primary side. Thus, the object and intended applications of the present invention are utterly different from those of Scarpa's device.

Difference Between Principles of Inventions

High-power high-voltage transformers, most of which are used in the transmission or distribution of electric power, are often attacked by extra high impulse voltages, such as lightning strikes. At the moment when such a high voltage is applied to a coil, it is not possible in reality for the turns in the coil to bear uniformly divided voltage, and the voltage is shared by the turns in extremely uneven proportions. As a result, destruction or burnout takes place between turns that bear the highest voltage. The

level of such voltage is often near to the total impulse voltage, as is well known. Such uneven voltage distribution is caused by the unevenly distributed capacitance between turns, that is, by the non-uniform distribution of capacitive reactance. The principle of Scarpa's invention is to solve this problem by sheathing the insulated central conductors with non-magnetic metal, connecting that sheathing to the ground to maintain it at the ground potential in order to eliminate unevenness in the distributed capacitive reactance, and thus ensuring uniform voltage shared by turns.

Also, in daily operation, the surface of the insulation on the central conductors of a high-power high-voltage transformer, in which high voltage is applied, has a potential almost equal to that of the conductor, and therefore, the insulation is eroded by the arc of discharge (static discharge) when the potential difference between the surfaces of insulators of adjacent turns is increased. To prevent this problem, Scarpa's invention sheathes the insulator surface with non-magnetic metal and grounds this metal to keep the potential differences between insulator surfaces of adjacent turns low in order to eliminate arc discharging of static electricity.

The present invention, on the other hand, puts a short-circuit ring against the coil in order to direct noise-superposed dirty current existing in the primary coil into the short-circuit ring by means of electromagnetic induction, thus promoting reflux. If the cross-sectional area of the short-circuit ring is large and the resistance is low in the above situation, most of the induced current will flow to this, instead of going to the secondary coil. However, if the ring is thin enough that the high frequency current of the noise can flow due to the skin effect, then the induced current of noise, without changing, will flow

within the short-circuit ring, instead of going to the secondary coil. On the other hand, only an extremely small portion of the necessary induced current of low frequency will flow in the short-circuit ring; almost all will flow in the secondary coil. Thus, to eliminate noise from the induced current in the secondary coil for cleaning is what the present invention aims at. In addition, the slight resistance of the short-circuit ring restrains local resonance in the coil, which flattens the action of noise elimination, improving the effects, as is intended by the invention.

Summarizing the actions of the present invention and Scarpa for comparison, Scarpa restrains overvoltage based on static induction action, promoting the well-being of the transformer itself in order to achieve its object, whereas the present invention generates induced current based on electromagnetic induction action, and adjusts the current to eliminate the noise in order to achieve the object of preventing malfunction of the system on the other side of the connection. Thus, the present invention and Scarpa are radically different from one another with respect to the principles of electrical engineering.

Since Scarpa's invention is based on the static induction action, its intended effect cannot be improved at all by short-circuiting the sheathing-insulated central conductors to apply short-circuit current when sheathing the conductors with non-magnetic metal. Therefore, the thickness of sheathing is not a matter of consideration for Scarpa. Rather, Scarpa suggests interruption of its metallic sheathing for preventing the sheathing from short-circuiting due to negative effects by produced excessive action, such as loss. This is because no action is based on static induction, in principle, and also because the

intensity of action has no relation to the current. In other words, the existence of such a short circuit is not required in the first place, and the grounded metal sheathing in Scarpa only works on a static induction plate.

On the other hand, the present invention is based on electromagnetic induction action, and therefore, no effects take place unless induced current flows. The conducting thin film is prepared for the purpose of using it as a short-circuit ring. Thus, careful selection of the thickness of the short-circuit rings is critical in order to discriminate between high frequency components comprising noise and low-frequency components of the current running in the short-circuit ring.

A further difference between Scarpa and the invention of the claims on appeal is that Scarpa discloses that the lead sheathing of the cable must be interrupted at each turn. Scarpa's objects are obtained by employing high-tension electric cables of the known type in the windings, in which the conductors are insulated by means of oil-impregnated paper and in which the outer metal sheathing of said cables is grounded and subdivided into sections to avoid the formation of a second winding. (Col. 2, lines 49-54). Each of the windings includes a central conductor, insulation material of oil-impregnated paper surrounding the conductor, a non-magnetic metallic sheathing disposed about and encompassing the insulation material, the metallic sheathing being subdivided into sections and the sections defining a gap therebetween to avoid the formation of a closed turn or winding.

The reference numeral 10 of Scarpa denotes gaps or interruptions in the metallic sheathing of the cable forming the high-voltage winding A, which gaps may be obtained,

for instance, by removing a portion of said sheathing 2" and 3" of the end of each turn and filling the resulting groove with a band or layer of insulating material 21, such as vulcanized synthetic rubber, which may be externally reinforced at will by an encircling non-magnetic wire winding 22, such as non-magnetic steel wire (Fig. 2) (col. 3, line 73 – col. 4, line 6). The gaps 10, as illustrated in Fig. 1, can be distributed in a spiral arrangement about the axis of the core C or in non-alignment relative to each other to prevent the sheathings 2" and 3" on the cables of windings A and B from forming closed turns. Alternatively, the gaps 10 can be aligned with one another in a vertical direction, as illustrated in Fig. 5 (col. 4, lines 24-30).

As was mentioned above, Scarpa discloses interruption of the metallic sheathing for preventing the sheathing from short-circuiting in the light of negating negative effects by produced excessive action, such as loss, when sheathing the insulated central conductors with non-magnetic metal, and thus Scarpa does not provide any short-circuit rings.

Another difference between Scarpa and the invention of claims on appeal is that, regarding non-magnetic metallic sheathing that encompasses insulated central conductors, Scarpa discloses that the fundamental principle of his novel construction is to use for both high- and low-voltage windings actual lead-sheathed cables, instead of ordinary insulated conductors employed for the conduction of electric power (col. 2, lines 20-23). The lead sheathing of the cable must, of course, be interrupted at each turn (column 2, lines 32-33).

Scarpa also discloses, at column 2, lines 35-42:

> "Cooling of the winding, which is very extensive, may take place naturally or by blowing air into the clearances left between the layers of the cables, and may even be supplemented, if necessary, for example in case the windings are formed by lead sheathed cables the core of which has the form of a hollow conductor by circulating by means of a pump the oil contained within the cable through a cooler" (emphasis added).

As can be appreciated from column 2, lines 49-54 of Scarpa, each of the windings includes a central conductor, insulation material of oil-impregnated paper surrounding said conductor, a non-magnetic metallic sheathing disposed about and encompassing said insulation material, the metallic sheathing being subdivided into sections and the sections defining gaps therebetween to avoid the formation of a closed turn or winding. The layers of insulating material 2' and 3' are protected by a metallic sheath 2" and 3", respectively of non-magnetic metal, such as lead, or a coil or [of?] non-magnetic wire or tape (column 3, lines 37-40). The principle of Scarpa's invention is to utilize the electrostatic effect of metallic sheathing, and his invention does not specify the form. Any form can be used if only it can electrostatically maintain the ground potential, and passing current in the item is an extra service. Therefore, the size of its cross-sectional area has does not relate to the main subject. It goes without saying that just putting metallic sheathing over the insulator that encompasses the central conductors of a cable cannot allow induced current to run in the sheathing. This is due to the fact that the magnetic flux produced by the current in the central conductor runs parallel to the sheathing. More particularly, this metallic sheathing as such does not work as a short-circuit ring by nature. Instead, it words as electrostatic shielding because it interlinks with the electric flux in the central conductor.

In contrast to the above, the present invention is characterized by, for example, with respect to the embodiment of Figs. 7 and 8, conducting thin film on each turn of the insulated copper wire being closely connected to the conducting thin films of adjacent turns to make a gathered set, where the metallic thin film interlinks with magnetic flux functions as a short circuit, and the induced current running in it is utilized, and further, the skin effect of its thin film is utilized to discriminate between adverse high-frequency noise and necessary low frequency power. Therefore, it is necessary to carefully select the thickness. In other words, due at least in part to the thin conducting film, the entire structure and action of the claims on appeal are totally different from the device of Scarpa.

The Examiner still concludes that the metallic shield 28 placed between the primary coil and the secondary coil of McLoughlin is a short-circuit ring. However, the second paragraph on page 9 of the main Appeal Brief indisputably indicates that the metallic shield 28 is not a short-circuit ring.

It is believed that no fee is due for this submission. Therefore, if any additional fees are necessary in the filing of this Supplemental Appeal Brief, the Commissioner is authorized to charge such fees and/or credit any fees to our Deposit Account No. 22-0261.

It is respectfully requested that the rejection of the Examiner not be sustained.

Respectfully submitted,

Date: November 7, 2003

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